

Sunspotters Program Chair:

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Introduction.

The purpose of this program is to encourage solar observing with an eye toward educating the amateur astronomer on solar features and their evolution. By following this regimen the observer will learn the various features of solar activity, learn how these change during their passage across the disk, and learn how to develop a regular observing program.

Rules:

Before you start any solar observing program, make absolutely certain that you have safe filters and a safe set-up.

Only use filters from reputable sources, and never use a "solar filter" that screws into an eyepiece. As Richard Hill states in *Observe and Understand the Sun*:

"Observing the sun is the only inherently dangerous observing an amateur astronomer can do. Be aware of this at all times and take all necessary precautions. If you do not know a filter or procedure is safe then do not use it! Always err on the side of safety. An eye once damaged is forever damaged. Filters that let too much INFRARED light through can burn an eye if used visually. There is NO PAIN when this happens. Burned retinas can not be repaired. Excessive ULTRAVIOLET light has been shown to cause cataracts. So be very careful."

In the League's Sunspotter program, you will make two sets of drawings. The first set is five detailed sketches of sunspot groups. The second set is 20 or more sketches of the whole solar disk during two solar rotations (one rotation is about 30 days).

Artistic skill is not a requirement! Just diagram what you see as well as your skills allow. Use a number 2A lead pencil for best results.

Your five sunspot sketches must be done on five different days. These sunspot group drawings must be accurately labeled as to time, observing conditions, equipment used, and sunspot class. On each drawing, several features must be identified. The attached Sunspot Drawing Form shows the features you need to sketch and label. In order to see

and identify all of the items, you will need to observe a rather complex sunspot group of Modified Zurich class D, E, or F. You may need to observe the sunspot group close to the limb to pick out all the details.

In the second set of drawings, you will sketch the whole disk of the sun throughout the passage of large sunspot groups during two different solar rotations. On the Solar Disk Drawing Form, outline the sunspot penumbrae and shade in the umbrae on the large circle. Classify all the sunspot groups on the disk and show the McIntosh classification letters on the small circle. Do a sunspot count, compute the Wolf Number, and fill out all the other blanks on the form. One of your sketches (in either the first or second set of drawings) should show the "Wilson effect". We realize that weather conditions may prevent daily observing, but at least half of the days for any given rotation should be observable. You should have a minimum of 20 whole disk drawings for the two rotations.

To qualify for the League Sunspotter Program, you must be a member of the Astronomical League, either as a member of a club affiliated with the League, or as a Member-at-Large of the League.

When your observations and drawings are completed, have them examined by an officer of your society, or a qualified, experienced second party if you do not belong to a Society. Have this person write a note verifying the work. Send this note and copies of the observations to the Astronomical League Observing Awards coordinator referred to above. The Sunspotters Program Certificate will be forwarded to your club officer for formal presentation, and your name will appear in the *Reflector*. Members-at-Large should send copies of their observations directly to the Astronomical League Observing Awards coordinator.

The Sunspotters Program is based on the League publication *Observe and Understand the Sun*. This manual includes material on sunspot classification and heliographic coordinates, as well as solar observing, telescopes, filters, and photography. It is available through the Astronomical League Sales Office. Check the most recent issue of the League's newsletter *The Reflector* for the League Sale's address and the price of the Observe Guide.

Terms and definitions you may need to know:

Faculae: relatively large (greater than an arc minute) irregularly shaped light area; sometimes serpentine in shape. Sunspots are usually located in Facula.

Granulation: fine grain structure of the solar photosphere. Grains appear to be one to two arc-seconds in diameter.

Light bridge: a bright ribbon or band that may appear to connect two sunspots.

Limb darkening: the effect of perspective where the edge of the solar disk appears darker than the center because it is a sphere.

McIntosh Sunspot Classification System: Adds classes for the type of the largest sunspot and sunspot distribution to the Modified Zurich Class. Pages 7-11 of the Observe the Sun has a good discussion and figures to help you classify groups by this three-letter system. (For example, a small lone sunspot with a penumbra might be coded as Hsx. A very large complex group might be Fkc.)

Modified Zurich Sunspot Class: A seven class (A-F, H) system of describing a sunspot group. The size of the group and distribution of penumbrae, if any, are factors.

Penumbra: a gray area which frequently, but not always, appears around an individual sunspot or group of sunspots.

Penumbral fibril: fiber like lines that may appear to radiate out from an umbra into the surrounding penumbra.

Penumbral fragment: a penumbra without a sunspot.

Penumbral grain: granular or small patchy structure that may be visible in the penumbra.

Pores: tiny, less than one arc-second, dark areas which are not as dark as a sunspot.

Solar north: Solar north is not the same as terrestrial north. During the course of an earth year, the sun's axis tilts over 26 degrees east and west of the earth's axis, and about 7 degrees toward and away from earth. These variations are due to a combination of the axial tilts of the Earth and Sun. Diagrams such as those on pages 13 and 14 of the Observe the Sun manual will help you estimate Solar north for the day of your observation.

Solar rotation: the sun does not rotate as a solid body. The equator rotates in about 25 days, the polar area in about 30 days. Use about 28 days for a solar rotation at typical sunspot latitudes.

Sunspot Group: A group may be anything from a single isolated sunspot to a complex elongated cluster of spots.

Umbra: The dark black area of a Sunspot.

Wilson effect: This effect of perspective is seen when a sunspot is near the solar limb. The umbra appears displaced within the penumbra, usually toward the center of the sun.

Wolf Sunspot number (R): a traditional method of counting sunspots. Count the individual sunspots. Count the number of groups. (An individual sunspot can count as a group if it is sufficiently separated from other spots or groups.) The Wolf number is ten times the number of sunspot groups plus the number of spots.

About the September, 1997 revision:

The revised Sunspotter award requirements consolidate the former two-part program into one program and one certificate. The sketching and required data have been simplified, some definitions have been added, and new sample forms have been provided.

Enjoy your daytime observing!